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# INFLUENCE OF CYCLING AND SWIMMING ON MUSCULAR ENDURANCE AMONG LONG DISTANCE RUNNERS

**Dr. J. GLORY DARLING MARGARET,[a,*]**

[a]YMCA College of Physical Education, Chennai – 600 035, Tamilnadu, India
**Corresponding Author ph: +91-9444886080 Email:* drjgdpe@gmail.com

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**ABSTRACT** The purpose of the study was to find out whether there would be any significant improvement on muscular endurance as a result of cycling and swimming training among long distance runners. To achieve the purpose of the study, 45 long distance runners from different colleges and SDAT trainees were selected at random within Chennai. The selected subjects were in the age group of 18 to 22 years. The subjects were randomly divided in to three groups of 15 subjects in each group. Group one acted as experimental group I and group two acted as experimental group -II and group three acted as control group. Group three underwent routine without any special treatment and group I underwent cycling exercises and group II underwent swimming exercises for six weeks. Pre test scores were collected on selected criterion variables, namely, muscular endurance of lower body using sit ups and muscular endurance of upper body using push-ups. After six weeks of experimental treatments to the experimental groups, scores on selected criterion variables were obtained. The differences between the initial and final scores were the effect of respective experimental treatments. To test the statistical significance, the scores were subjected to ANCOVA and Scheffes' post hoc test. The results of the study proved that cycling and swimming exercises significantly improved the muscular endurance of upper body and lower body of the long distance runners.

**Key words:** Cycling, Swimming, Muscular Endurance

## INTRODUCTION

Athletic performance is the sum total of numerous facts on which, it will be varying from individual to individual, even if they ultimately achieve similar results in competition. The suitability of exercise for competitive training is defined exclusively as to how useful it is for development of performance in a given competitive event. Exercise must be suitable for

developing the pre-requisites of performance necessary for competitive form of sports, in accordance with the demands of the performance structure over a long period. They must also steadily increase load tolerance, develop athletic performance itself in an optimum and stable way and bring about accelerated recovery.

Swimming is an excellent form of exercise. Because the density of the human body is approximately similar to that of water, the body is supported by the water and less stress is therefore placed on joints and bones.. Swimming is primarily an aerobic exercise due to the long exercise time, requiring a constant oxygen supply to the muscles, except for short sprints where the muscles work anaerobically. As with most aerobic exercise it is believed to reduce the harmful effects of stress.

In recent years, sports persons began to use exercise bicycle as one of their routine fitness exercises to keep their fitness levels and improve strength, $VO_2$ max and other cardiovascular endurance. These upright bicycles and indoor cycling bicycles which are bicycles built for riding in indoor cycling classes. Some models feature handlebars that are connected to the pedals so that the upper body can be exercised along with the lower body. Most exercise bicycles provide a mechanism for applying resistance to the pedals which increases the intensity of the exercise. Resistance mechanisms include magnets, fans, and friction mechanisms. Some models allow the user to pedal backwards to exercise antagonist muscles which are not exercised in forward pedaling. Many bicycles now include attached television screens.

Exercise bicycles are used for exercise, to increase general fitness. The exercise bicycles has long been used for physical therapy because of the low-impact, safe, and effective cardiovascular exercise it provides. The low-impact movement involved in operating an exercise bike does not put much stress on joints and does not involve sporadic motions that some other fitness equipment may require. Stationary bikes are also used to exercise for weight loss. A vigorous one-hour ride on a stationary bike burns about the same number of calories as running for an hour at 7 mph.

Long distance runners require long term endurance to excel in long distance running. There are different training methods being following by these athletes to improve their long term endurance. However, the effect of swimming and cycling in improving the long term endurance of long distance runners were not researched fully. Hence, the investigator selected this research topic to find out the influence of cycling and swimming on muscular endurance among long distance runners.

## STATEMENT OF THE PROBLEM

The purpose of the study was to find out the influence of cycling and swimming on muscular endurance among long distance runners.

## HYPOTHESIS

It was hypothesized that there would be significant improvement on muscular endurance of upper body and lower body of the long distance runners due to cycling and swimming exercises.

**Dependent Variables**

1. Upper Body Muscular Endurance (Push-ups)
2. Lower Body Muscular Endurance (Sit ups)

**In dependent Variables**

1. Cycling
2. Swimming

## METHODOLOGY

To achieve the purpose of the study, 45 long distance runners from different colleges and SDAT trainees were selected at random within Chennai. The selected subjects were in the age group of 18 to 22 years. The subjects were randomly divided in to three groups of 15 subjects in each group. Group one acted as experimental group I and group two acted as experimental group -II and group- three acted as control group. Group three underwent routine without any special treatment and group I underwent cycling exercises and group II underwent swimming exercises for six weeks.

Pre test scores were collected on selected criterion variables, namely, muscular endurance of lower body using sit ups and muscular endurance of upper body using push ups. After six weeks experimental treatments to the experimental groups, scores on selected criterion variables were obtained. The differences between the initial and final scores were the effect of respective experimental treatments. To test the statistical significance, the scores were subjected to ANCOVA and Scheffes' post hoc test.

## RESULTS AND DISCUSSION

The detailed procedure of analysis of data and interpretation are given below.

## RESULTS ON MUSCULAR ENDURANCE OF LOWER BODY

The statistical analysis comparing the initial and final means of, Muscular Endurance of Lower Body due to cycling and swimming exercises among long distance runner is presented in Table I

**Table I**
**COMPUTATION OF ANALYSIS OF COVARIANCE OF MUSCULAR ENDURANCE OF LOWER BODY**

| | Cycling Group | Swimming Group | Control Group | Source of Variance | Sum of Squares | df | Mean Squares | Obtained 'F' |
|---|---|---|---|---|---|---|---|---|
| Pre Test Mean | 34.13 | 35.27 | 36.60 | Between | 45.73 | 2 | 22.87 | 1.66 |
| | | | | Within | 578.27 | 42 | 13.77 | |
| Post Test Mean | 38.40 | 37.53 | 36.60 | Between | 24.31 | 2 | 12.16 | 0.71 |
| | | | | Within | 716.93 | 42 | 17.07 | |
| Adjusted Post Test Mean | 39.66 | 37.60 | 35.27 | Between | 133.73 | 2 | 66.87 | 33.20* |
| | | | | Within | 82.57 | 41 | 2.01 | |
| Mean Diff | 4.27 | 2.27 | 0.00 | | | | | |

Table F-ratio at 0.05 level of confidence for 2 and 42 (df) =3.22 and 41 (df) =3.23.
*Significant

As shown in Table IV, the obtained pre-test means on Muscular Endurance of Lower Body on cycling exercises was 34.13, swimming exercises was 35.27 was and control group was 36.60. The obtained pre-test F value was 1.66 and the required table F value was 3.22, which proved that there was no significant difference among initial scores of the subjects.

The obtained post-test means on Muscular Endurance of Lower Body on cycling exercises was 38.40, swimming exercises was 37.53 and control group was 36.60. The obtained post-test F value was 0.71 and the required table F value was 3.22, which proved that there was no significant difference among post test scores of the subjects.

Taking into consideration of the pre-test means and post-test means adjusted post-test means were determined and analysis of covariance was done and the obtained F value 33.20 was greater than the required value of 3.21 and hence it was accepted that there was significant differences among the treated groups.

Since significant differences were recorded, the results were subjected to post hoc analysis using Scheffe's Confidence Interval test. The results were presented in Table II.

**Table II**
**Scheffe's Confidence Interval Test Scores on Muscular Endurance of Lower Body**

| MEANS | | | | Required . C I |
|---|---|---|---|---|
| Cycling Group | Swimming Group | Control Group | Mean Difference | |
| 39.66 | 37.60 | | 2.05* | 1.34 |
| 39.66 | | 35.27 | 4.38* | 1.34 |
| | 37.60 | 35.27 | 2.33* | 1.34 |

***** Significant

The post hoc analysis of obtained ordered adjusted means proved that there was significant differences existed between cycling group and control group (MD: 4.38). There was significant difference between swimming group and control group (MD: 2.33). There was significant difference between treatment groups, namely, cycling group and swimming group (MD: 2.05).

## DISCUSSIONS ON FINDINGS

The effect of cycling and swimming Muscular Endurance of Lower Body is presented in Table I. The analysis of covariance proved that there was significant difference between the experimental groups and control group as the obtained F value 33.20 was greater than the required table F value to be significant at 0.05 level.

Since significant F value was obtained, the results were further subjected to post hoc analysis and the results presented in Table II proved that there was significant difference between cycling group and control group (MD: 4.38) and swimming group and control group (MD: 2.33). Comparing between the treatment groups, it was found that there was significant difference between cycling group was better than swimming group in improving Muscular Endurance of Lower Body of long distance runners.

Thus, it was found that cycling group was significantly better than swimming and control group in improving Muscular Endurance of Lower Body of long distance runners.

## RESULTS ON MUSCULAR ENDURANCE OF UPPER BODY

The statistical analysis comparing the initial and final means of, Muscular Endurance of Upper body due to cycling and swimming exercises among long distance runner is presented in Table III

**Table III**

**COMPUTATION OF ANALYSIS OF COVARIANCE OF MUSCULAR ENDURANCE OF UPPER BODY**

| | Cycling Group | Swimming Group | Control Group | Source of Variance | Sum of Squares | df | Mean Squares | Obtained F |
|---|---|---|---|---|---|---|---|---|
| Pre Test Mean | 11.93 | 12.13 | 12.53 | Between | 2.80 | 2 | 1.40 | 0.28 |
| | | | | Within | 212.40 | 42 | 5.06 | |
| Post Test Mean | 14.73 | 15.40 | 13.33 | Between | 33.38 | 2 | 16.69 | 2.39 |
| | | | | Within | 293.87 | 42 | 7.00 | |
| Adjusted Post Test Mean | 15.00 | 15.47 | 13.00 | Between | 50.99 | 2 | 25.49 | 12.79* |
| | | | | Within | 81.73 | 41 | 1.99 | |
| Mean Diff | 2.80 | 3.27 | 0.80 | | | | | |

Table F-ratio at 0.05 level of confidence for 2 and 42 (df) =3.22 and 41 (df) =3.23.
*Significant

As shown in Table III, the obtained pre-test means on Muscular Endurance of Upper body on cycling exercises was 11.93, swimming exercises was 12.13 was and control group was 12.53. The obtained pre-test F value was 0.28 and the required table F value was 3.22, which proved that there was no significant difference among initial scores of the subjects.

The obtained post-test means on Muscular Endurance of Upper body on cycling exercises was 14.73, swimming exercises was 15.40 was and control group was 13.33. The obtained post-test F value was 2.39 and the required table F value was 3.22, which proved that there was no significant difference among post test scores of the subjects.

Taking into consideration of the pre-test means and post-test means adjusted post-test means were determined and analysis of covariance was done and the obtained F value 12.79 was greater than the required value of 3.21 and hence it was accepted that there was significant differences among the treated groups.

Since significant differences were recorded, the results were subjected to post hoc analysis using Scheffe's Confidence Interval test. The results were presented in Table IV.

**Table IV**

**Scheffe's Confidence Interval Test Scores on Muscular Endurance of Upper body**

| MEANS | | | | Required . C I |
|---|---|---|---|---|
| Cycling Group | Swimming Group | Control Group | Mean Difference | |

| | | | | |
|---|---|---|---|---|
| 15.00 | 15.47 | | 0.47 | 1.33 |
| 15.00 | | 13.00 | 2.00* | 1.33 |
| | 15.47 | 13.00 | 2.47* | 1.33 |

***** Significant

The post hoc analysis of obtained ordered adjusted means proved that there was significant differences existed between cycling group and control group (MD: 2.00). There was significant difference between swimming group and control group (MD: 2.47). There was no significant difference between treatment groups, namely, cycling group and swimming group (MD: 0.47).

## DISCUSSIONS ON FINDINGS

The effect of cycling and swimming Muscular Endurance of Upper body is presented in Table III. The analysis of covariance proved that there was significant difference between the experimental groups and control group as the obtained F value 12.79 was greater than the required table F value to be significant at 0.05 level.

Since significant F value was obtained, the results were further subjected to post hoc analysis and the results presented in Table IV proved that there was significant difference between cycling group and control group (MD: 2.00) and swimming group and control group (MD: 2.47). Comparing between the treatment groups, it was found that there was no significant difference, however cycling group was better than swimming group in improving Muscular Endurance of Upper body of long distance runners.

Thus, it was found that cycling and swimming exercises was significantly better than control group in improving Muscular Endurance of Upper body of the long distance runners.

## DISCUSSIONS ON HYPOTHESES

As stated in first hypothesis that there would be significant improvement on muscular endurance of upper body and lower body of the long distance runners due to cycling and swimming exercises, the hypothesis was accepted at 0.05 level of significance.

## CONCLUSIONS

Within the limitations and delimitations of the study, the following conclusions were drawn

a. It was concluded that Cycling and Swimming exercises significantly improved muscular endurance of lower body of the long distance runners. It was also found that

cycling was significantly better than swimming in improving muscular endurance lower body.

b. It was concluded that Cycling and Swimming exercises significantly improved muscular endurance of upper body of the long distance runners. It was also found that there was no significant difference between cycling swimming in altering muscular endurance lower body.

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